A.D. 1855 . . . . . N° 129.

SPECIFICATION

OF

CONSTANT JOUFFROY DUMÉRY.

SMOKE-PREVENTING APPARATUS.

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Smoke-preventing Apparatus.

LETTERS PATENT to Constant Jouffroy Duméry, of Paris, in the Empire of France, and of 32, Essex Street, Strand, London, for the Invention of "IMPROVEMENTS IN SMOKE-PREVENTING APPARATUS."

Sealed the 25th May 1855, and dated the 18th January 1855.

PROVISIONAL SPECIFICATION left by the said Constant Jouffroy Duméry at the Office of the Commissioners of Patents, with his Petition, on the 18th January 1855.

I, CONSTANT JOUFFROY DUMÉRY, of Paris, in the Empire of France, and of 32, Essex Street, Strand, London, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN SMOKE-PREVENTING APPARATUS" to be as follows, viz.:—

Instead of allowing first the smoke to be formed and then of seeking by certain means to consume it, I prevent the formation of the smoke itself, by burning the gases as they are produced, by regulating the devellopment of such gases, and by conducting them in such manner as to insure their complete combustion.

My method of effecting this is simple; it consists of reversing the usual mode of supplying the fire with fresh fuel; that is to say, instead of throwing the fresh coal on the burning coal I place under the latter the fresh coal; thus the fresh coal is not suddenly seized in its whole mass by the high temperature of the burning fuel; no sudden distillation takes place; there is no

disproportion between the gases produced and the arrangement of the fire-place for burning the fuel and such gases; thus, the temperature of the boiler and furnace may be better sustained than when the fresh coal is heaped on the fire, which necessarily has a cooling effect.

Fig. 1, in the accompanying Drawings, is a portable grate. The fresh coal is laid on the lower grate A, and is pushed forward, so as to lift the burning coal in the upper grate B, and to be exactly under it in the passage of the oxygen; the contact of the heat distils it, and the gases that are emitted from it, only being able to escape by passing though the upper layer of coal ignite, and are changed into a pure flame. Fig. 2 is a similar grate for fixed fire-place.

Fig. 3 is a grate suitable for the kitchen, &c. The coal, as before described, is placed in the front part, and, as required, thrown into the grate B, at the same time lifting up the burning coal.

Figs. 4 & 5 represent the fire box of an ordinary steam engine of large or small dimension, with a false grate A, A, and a feeding box C, Fig. 5. The false grate A is passed under the lighted coal, and then raised, & while it is in this position the fresh coal is thrown under the false grate at *b, b*, in the ordinary manner, or by a box C, filled beforehand. The false grate A is withdrawn, and the box C is left in the fire-place until the distillation of the coal be partially effected; the box is then withdrawn and the gases continue to pass through the burning coal.

Fig. 6 represents a fire box for stationary or locomotive engines. The coal is thrown in the direction of the arrows by means of a screw or other suitable contrivance into the grate B under the burning coal. The fire-place, Fig. 7, is a stove with double grate, each part of which takes by turns the position of the other; the fresh coal is placed on the lower part A^1, which is raised after having taken away the ash box B, & when the fresh coal is under the grate A, the bars of the latter are withdrawn, so as to place in contact the fresh and the burning coal.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Constant Jouffroy Duméry in the Great Seal Patent Office on the 18th July 1855.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, Constant Jouffroy Duméry, of Paris, in the Empire of France, and of 32, Essex Street, Strand, London, send greeting.

Duméry's Improvements in Smoke-preventing Apparatus.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Eighteenth day of January, in the year of our Lord One thousand eight hundred and fifty-five, in the eighteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Constant Jouffroy Duméry, Her special licence that I, the said Constant Jouffroy Duméry, my executors, administrators, and assigns, or such others as I, the said Constant Jouffroy Duméry, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN SMOKE-PREVENTING APPARATUS," upon the condition (amongst others) that I, the said Constant Jouffroy Duméry, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Constant Jouffroy Duméry, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The formation of smoke can only be prevented by producing a perfect combustion, which requires, first, a combustible matter; second, a medium, having the temperature at which combustion is carried on; and, third, a sufficient volume of oxygen; and, above all, a good distribution and thorough mixing of this gas with the unaltered combustible gas. The latter requirement has not been fulfilled in the apparatus with ascending fuel, which would otherwise have been preferable to all others, but which, on account of this deficiency, and the difficulty met with in working them, have not produced any satisfactory result in practical manufactures.

The present improvements are intended, first, to facilitate the working of apparatus of said class with any kind of fuel, and in any kind of furnace; second, to put the atmospheric air into contact with the combustible gases at the moment and the point where they leave the fuel.

It is well known that oxygen may be procured in any quantity, since it forms a constituent part of the surrounding atmosphere, and is introduced above the flame in those apparatus where it cannot be made to pass through the grate bars. Hence the difficulty will be found not to consist in the want of oxygen

to be supplied, but in properly dividing, mixing, and uniformly distributing the same; and for attaining these ends I have devised the following contrivances, which have various constructions, according to the nature of the case to which they are applied, viz.:—Certain charging boxes; also a grate which is moveable in the vertical direction upon its whole surface; also a fixed grate having artificial or moulded fuel and a charging drawer; also troughs with vertical grates for natural coal with a discharging drawer; also curved scuttles, horns, or trumpets, that are stationary, and in which the coal alone is displaced.

As to the first of these apparatus, viz., charging boxes, they represent the improved apparatus in its simplest form (see Figs. 1 and 2, Sheet 1). They consist of boxes having the shape of desks, the top of which is pierced with holes or slots, the bottom being sliding. In order to use the boxes, supposing the fire box at work and filled with coal that is in a state of coke, I slide between the grate and the coke a false grate or perforated shovel, and raising this shovel, I form an angular space opening towards the door, and into which the charging box is introduced after having previously been filled with coal. The box having thus been placed, the false grate is taken out, so as to let the incandescent coke lie upon the box, thus heating the coal; the bottom of the box is also slided out, so as to give passage to the air; and finally the whole box is taken out, so as to put the ignited coke into direct contact with the raw coal. In this manner air is directly admitted to all the points where gas is formed and whilst it is being formed. This method of working is very simple and unexpensive to establish; however, as the doors have to be opened, as in ordinary charging, and on account of the cooling resulting therefrom, I only apply it in those cases where coal is cheap and the furnace not too large.

As to the second form, viz., grates which are so constructed as to rise with their whole surface equally, I make them with two trestles, one of which is in front, & the other at the back of the fire box, and upon which I place the grate bars and grate frame. Instead of legs, the trestles have racks (see Fig. 3, Sheet 1), that allow raising and lowering the cross bars of the same; each grate bar whilst rising meets under the upper plane of the grate a click, which holds and prevents it from descending when the trestles are lowered again. When the apparatus has just received a charge, and the trestles have re-descended, the grate bars and the four sides forming the frame are put into their places, and the grate is charged with coal; the whole is then raised so as to put the cold coal into contact with the under side of the grate that has been raised previously. The bars are then taken out one by one from the upper grate, and the lower grate is fully raised, so as to occupy the same place as the grate bars just taken out. When

the grate last mentioned has got into its place and each grate bar is supported by its click, the sides forming the grate frame are taken out through slots in front and on the sides of the furnace, the cross or supporting bars are then lowered again, and the apparatus is thus ready for receiving another charge. The present arrangement will be found particularly suitable for such kind of coal as requires frequent poking or leaves copious ashes, as the grate bars may easily be cleaned after each charging operation.

As to the third form of my improved apparatus, viz., the stationary grate for working with artificial or moulded fuel and charging drawer, the admixture of air being the main point for producing a good combustion, as has been stated above, and the passage of the air depending generally upon the accidental size, dimensions, and relative positions of the coal, I form by the use of moulded or artificial fuel such passages for the air as to obtain the result desired, not by accident, but regularly. For this purpose, if the fuel is moulded round, each piece is inserted in a tube of corresponding dimensions (see Figs. 5 & 6, Sheet 1), and I form with a row of these tubes a line, having the whole length of the fire box, placing as many of these lines on the same plane parallel with each as will fill the furnace, and also leaving the necessary interstices for the admission of air. The rows of tubes thus arranged correspond in fact to the surface of a grate, the bars of which are perforated with holes, and they are firmly united together and fixed a little below where the level of an ordinary grate would be. Each of the tubes that form this kind of table contains a spring, pressing laterally upon the cylindrical fuel, so as to allow it to rise by friction, but to prevent it from sliding down again. A table, which is exactly similar to the one just described, is placed under the first, so as to be capable of sliding; the tubes contain no springs inside, but they have at their lower extremities pistons fitted into them, which may be moved up and down by a rack or any other suitable means. Before inserting the sliding table under the fixed one, each of the tubes is filled with one or several pieces of artificial fuel, and if the fire requires feeding the pistons are moved upwards. When the pistons have reached the end of their stroke, *i.e.* when the coal cylinders have been introduced into the tubes of the upper table, and are retained therein by the pressure of the springs above mentioned, the pistons are lowered and the drawer drawn out to be replenished again. If the coal is not liable to be deformed by combustion, the apparatus only consists of the two tables described, one of which is stationary and the other moveable; but if the fuel is likely to swell, break, and be distorted during combustion, I add above the spring tubes a grate, having holes corresponding to those of the stationary and moveable tables, through which the coal passes, so as to burn & distort above the grate.

Duméry's Improvements in Smoke-preventing Apparatus.

The fuel employed as above may be supposed to have the cylindrical or any other suitable shape; it may, for instance, be moulded or sawed in the shape of tablets, which may be put upright in lines, like the lines of cylinders above stated, leaving the proper space between the different rows, and thus giving to the furnace the appearance of a lamp with flat wicks arranged in parallel lines.

As to the fourth form of my improved apparatus, viz., troughs with a vertical grate for coal in its natural state, the fuel-carrying drawer, that has been described as applicable to burning moulded fuel, constituting in this kind of apparatus quite a novel arrangement for facilitating the charging of furnaces, in which horizontal arrangements are to be preferred, I apply the same also to charging ordinary coal in the following manner (see Figs. 7 & 8, Sheet 1):—The conical scoops, horns, or trumpets, which I will herein-after describe, have plane sides in this case instead of curved ones. The length of said sides is the same as that of the furnace; they are limited in width, so as to facilitate the entrance of air, and their number depends on the width of the furnace. Corresponding with the longitudinal cones, I fix on the moveable table other trumpets whose axes coincide with those of the upper ones, and whose sides form an extension, as it were, of those of the upper cones. The bottom of these lower cones is furnished like those for the moulded fuel, with moveable pistons, that can be made to ascend. When the moveable piston has been raised, so that it has entered the upper cones a little, one or more bars are introduced into holes made at the lower parts of the panels or sides at the end of the trumpets, and only when these bars are fully introduced, so as to prevent the descent of the fuel, the pistons are lowered again, after which I withdraw the drawer and charge it again. The lower sliding table may also be made in parts, that is to say, it may only have one line of charging cylinders, which would have to pass successively under all the upper lines and charge each of them separately. The novel features of this arrangement are the obliqueness of the sides, the lateral air passages, the mode of supporting the coal below the plane of combustion, and the fuel-carrying drawer, to be used as a part or as a whole.

As to the fifth form of my improved apparatus, viz., the curved and fixed scoops, horns, or scuttles, in which the coal alone is moved:—In the two contrivances first described above, the pieces upon which the fuel rests, upon which combustion is effected, and through which the air is made to pass, are moveable.

In the two next arrangements, the parts which raise the coal never get into contact with combustion, but are placed perpendicularly, and might also not

suit every quality of coal. In order, therefore, to be able to use any kind of coal, and also to render my principles of admixture applicable to any furnaces, and even to locomotive engines where vertical space is wanting and it would be impossible to work from below, I have devised the curved horns, which receive the coal on the side of the furnace, and by means of which the same is made to rise in the interior of the furnace by mechanical agents that are completely outside the place where combustion goes on.

In order to produce in these apparatus a proper draught, notwithstanding the ascension of the fuel, I use an oblique mode of ascension upon inclined planes or grates. In order to push or propel the fuel forwards, and prevent it sticking to the sides, and also the propeller from coming into contact with the fire, I use flues with an increasing cross section. Also, in this arrangement, for the purpose of effecting the charge of the fuel, notwithstanding the finally ascensional direction given to it, I use curves of a long radius.

This fifth form, being applicable in most cases, owing to its simplicity and small dimensions in the vertical direction, I will now endeavour to shew, by some examples, that by some very simple modifications to be made according to the furnace or the locality, they may be employed for almost any purpose. Thus, by applying the principle to domestic chimneys, they may have a very simple construction by means of a double-shelved grate (see Figs. 9 & 10, Sheet 2). The upper grate is for holding the ignited coal that is in a state of coke, and the lower grate receives the new coal which it is required to burn. The fuel before being shoved under the first grate is laid on the projecting part of the lower grate. The fuel as it is pushed forwards follows a direction parallel to the lower grate, and throws up the coal that has been deprived of most of its smoke, and when it arrives on the upper grate allows it to drop the ashes and clinkers. The bars of the upper grate may be horizontal, if required. In this manner perfect combustion is attained with fixed grates, in which the charge alone is moveable and intermittent, whilst the apparatus is fixed, and all phenomena of combustion, viz., distillation, inflammation, exterior radiation, and other phenomena relating thereto, are quite continuous and regular.

In order that the use of the present improved apparatus may not be restricted to such chimneys as have their grates narrow enough for perfect penetration by oxygen with open fire, we apply chimney or calorifere apparatus to them, these apparatus being closed totally or nearly so with opaque or transparent portions, so that in these apparatus, as in the manufacturing apparatus described hereafter, the air may be forced to pass through all the layers of the fuel before passing into the chimney (see Figs. 11, 12, and 13, Sheet 2).

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Fig. 14, which represents the improved kitchen fires, is intended to shew that the introduction of fresh fuel may be varied at will, the main object of the present Letters Patent being the possibility of regulating by means of the supplies of air. In kitchen fires, where it is not required to see the fire, the grate is only single, and the fresh fuel entering under the coke lifts it up, and pushes forward that portion which has already been sufficiently purified; it may then be stirred by poking the fire. In this case, the same as in chimneys, the upper portion of the furnace need not be opened, and the culinary operations interrupted for effecting the charge. The combustion is carried on with perfect regularity, and the apparatus in which it takes place is quite stationary, and thus these apparatus work in a manner analogous to that in which I work my improved manufacturing furnaces. For the boilers of locomotives, marine engines, &ª, I employ trumpets of the same kind, taking care to bend them a little more than in the previous applications, so as to facilitate the introduction of fuel. However, to obtain the necessary power for operating the sliding of the charge at a certain distance, I provide each trumpet with a power apparatus that may be set in motion by one man, as seen at Fig. 21, Sheet 3. With the arrangement shewn, of two converging trumpets, the cinders or clinkers collect in the centre of the fire bed, from whence they may be taken out either by the middle grate bars or by the small doors in front of the fire box.

In the improved furnaces, constructed according to these principles, the flame and the gases take their natural course; combustion may be effected in a very thick layer, and the draught or blowing may be made as strong as may be required by the nature of the work or of the fuel without diminishing the calefactory power, since the mixing of air and the gases takes place at the beginning of the operation. Hence, the apparatus may be advantageously employed, both for producing the high temperature required for metallurgic operations, and for burning hard and dry fuel, such as lignites, anthracites, peat, &ª, which at present cannot be used in many circumstances. This combustion may be rendered still more perfect by a supplementary and continuous admission of air above the fire, which can be effected without any inconvenience, since a continuous admission can produce good effects only with a continuous operation. In the preceding example the mechanism is supposed to be placed in the curved space inside the trumpet; but if this arrangement cannot be employed for want of space, &c., the propelling mechanism may be placed as shewn at Fig. 15, Sheet 2. If for producing a great uniformity of temperature it be required, any suitable continuous feed apparatus, such as a wheel pump with sliding paddles, as shewn at Fig. 16, Sheet 2, may be resorted

to. In case the trumpets cannot be put back to back, and at the same time the fire grate is long enough for the coal filling a long curve impeding the draught, I use several trumpets placed in along the furnace, as shewn at Fig. 17, Sheet 2. In the example given, the two trumpets are of an ordinary size, and the fuel is charged and propelled by means of a portable box containing the power gear (s. Fig. 18, Sheet 2). This box is secured to the end of the trumpet, and the driver is pushed forward by means of the crank actuating a propelling screw inside. This arrangement is particularly advantageous in case there is a number of furnaces to be worked one by the side of another. One loading apparatus will do for the whole line of furnaces, but when this line is very long, it is placed upon a carriage travelling before the furnaces, and mounted upon the same in such manner that it can be raised and lowered according to the height of each trumpet. For puddling, reverberatory, and other furnaces similar arrangements are used, only adding a blasting apparatus when required. When simultaneous charging becomes a matter of difficulty, on account of the thickness of the walls, I use either charging boxes that are quite independent of the trumpets, or piston-carrying boxes, which are lowered for pushing the charge forward (see Fig. 26, Sheet 3). For large and small smiths' fires, I improve the results obtained by caps or reflectors of fire clay, reflecting the action of the blowing apparatus, and throwing the heat back upon the piece in the fire, as illustrated by Fig. 19, Sheet 2. For some descriptions of coal, which readily emit their gases and yield a large quantity of dry coal, I divide the fire-place into two parts, or rather, I add a complementary grate, upon which the purified coal falls, and is consumed at the same rate as it is procured in the grated trumpets (see Fig. 20, Sheet 2).

It is to be fully understood that each of the apparatus above briefly described are or may be made applicable to any use by selecting the form and dimensions most suitable for the operation; also any fuel may be used in them provided the dimensions be suited to the same.

The following is a full and particular description of the Sheets of Drawings above alluded to.

Fig. 1 & 2 shew an ordinary furnace to be used in the manufactures, with false grate and charging box. A, A, false grate, having the same width as the furnace if possible; B, B, ordinary grate; C, C, charging box. *d*, *d*, Fig. 1, capacity into which the coal is put, either by means of a shovel or by means of the charging box C, C, Fig. 2.

Fig. 3 represents a furnace with two grates, that take each other's place upon their whole surface. A, A, grate bars, having got into their ultimate position. A^1, A^1, grate bars loading; B, B, sliding ash box; C, C, racks,

carrying cross bars, upon which the grate bars are laid; D, D, shaft pinion and crank; E, fire bridge; F, coal that has been converted into coke and burns without flame; G, fresh coal, that has not been lighted yet; H, four ledge bars for maintaining the coal during its ascension, which can be taken out through slots in the furnace when the grate has come home.

Fig. 4, click or finger for supporting the grate bars when they have arrived in the upper position. *a*, fixed or stationary click or finger; *b*, moveable click or finger for letting the grate bar pass and retaining it.

Fig. 5 shews a sectional elevation through A, B, Fig. 6, of a furnace arranged for working with artificial or moulded coal; and Fig. 6 is a sectional plan of the same furnace through C, D, Fig. 5. E, stationary frame, carrying the bars & upper ducts; F, grate bars; G, upper ducts; H, compressed spring for retaining the moulded fuel; J, lower frame, which is moveable; K, lower ducts, in which the moulded coal is inserted; L, pistons for raising the fuel; M, pinions and racks for the raising motion. Instead of these, I also sometimes use chains fixed at one end to a drum, and at the other to the ends of rods without teeth, to be used in lieu of racks. Z, bevel wheel, for setting in motion all the lines by one single crank.

Fig. 7, furnace, with charging drawer for natural fuel, shewn in sectional elevation through the line A, B, Fig. 8.

Fig. 8 is a sectional plan of said furnace, through the line C, D, Fig. 7. N, interior grooves with inclined sides, and perforated, in the manner of vertical grates; O, fixed frame, carrying the grooves N; P, sliding frame, carrying the extension of the grooves N; Q, pistons, with rods and lifting pinions or chains; R, holes for inserting the maintaining grate bars; S, wheels for moving the carriage upon the rails.

SHEET 2.

Fig. 9 is a chimney grate.

Fig. 10, a front of a chimney for rooms.

Fig. 11, front elevation of a small portable chimney or stove, with lateral introduction of the fuel and forced blast.

Fig. 12, section of Fig. 11 through the line A, B.

Fig. 13, section perpendicular to Fig. 12, through the line C, D, Fig. 12.

In the three Figs. last mentioned, the course of the coal is indicated by firm arrows, and that of the air by dotted ones.

Fig. 14 is a section of a kitchen furnace, the firm arrow shewing the direction in which the fuel is introduced, and the dotted arrows the direction of the current of air.

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Fig. 15, section of trumpet, with external propelling mechanism. P, propelling piston; Q, Q, external rack; R, pinion gearing into the rack; S, fly wheel on the pinion shaft.

Fig. 16, section of a continuous feeder with sliding paddles, similar to those used in hydraulic apparatus. In this feeder, a lateral excentric causes the paddles to slide from the centre to the circumference whilst the shaft receives a rotary motion.

Fig. 17, furnace of a marine engine, with two trumpets or horns, one above the other, for dividing the layers of fuel, and facilitating the admission of air. T, trumpet, furnished with its charging box; U, charging box, secured to the lower trumpet by means of a stud T.

Fig. 18, charging box, shewn in horizontal section, so as to bring the propelling screw and internal mechanism into sight. In larger pistons I use two parallel screws that work together by spur gearing.

Fig. 19 is a section of a smith's fire. A, pieces of iron to be heated; B, direction in which the air is blown by the blowing apparatus; C, introduction trumpet for the coal; D, tuyer; E, opening, for raking the air passage that leads into the coke; F, cap of fire clay for reflecting the heat; G, chimney back.

Fig. 20 is a longitudinal section of a furnace, with trumpets and additional grate. A, boiler; B, fire door; C, trumpet, with vertical grate; D, intermediate fire bridge, which is placed a little lower than usual; E, bars of the grate for the coke; F, fire bridge, having the usual height; G, ash box for the coke fire. This ash box has doors that fit tight, for regulating and stopping at will the working of the furnace.

SHEET 3.

Figs. 21 & 22, front and side view of a boiler furnace; Figs. 23 & 24, vertical and horizontal sections of the same, through the lines A, B, Fig. 24, and C, D, Fig. 21, respectively. In these four Figs. the same letters of reference stand for like parts.

E, generator; F, fire box; G, trumpets for receiving the fuel; G^1, grates of the trumpets or air passages; H, propelling piston for the fuel, shewn at Fig. 21, 22, & 24, at the beginning and end of its stroke; H^1, segmental worm wheel; H^{11}, screw working the same; H^{111}, crank for working the two pistons together; I, door for taking out the clinkers that rise to the surface; I^1, double doors, for forcing the fresh air to pass before the door I, take off its temperature, and thus supplying hot air to the fuel; J, door of the ash box; K, small openings for cleaning the middle bars. These openings vary in size,

according to the number of the bars to be introduced. L, holes for passing the grate bars, by which the fresh coal is separated from the ignited fuel; said bars are inserted when it is desired to put the fire out. M, door, which is for taking out the fresh fuel, and also the fuel that is ignited when the bars introduced through the holes L have been taken out; N, cast-iron plates or frame, upon which the whole mechanism is secured.

Fig. 25 represents a section of a furnace for a locomotive engine. A, trumpets for introducing the fuel; A^1, grate of the trumpets for the passage of air; B, piston for propelling the coal; C, door for clearing out; C^1, fastenings for said door; D, passage or channel for introducing the coal into the trumpets.

Fig. 26 is a section of a reverberatory furnace. A, introduction trumpets; A^1, grates of the trumpets; B, hinged box, containing the propelling pistons and actuating screws; B^1, counterweight, for balancing the weight of the boxes B; C, crank, acting upon by a central pinion upon the two wheels, keyed upon the screws.

By the use of the apparatus described and represented as above I obtain the following novel and characteristic results, viz., by the whole of the apparatus described the air is made to pass through the fuel whilst the same is moving. A most congenial direction of draught is obtained as it proceeds upwards, the same as in ordinary furnaces. The air is sifted or filtered through the whole fire bed. A complete and unfailing mixture is effected between the atmospheric air and the combustible gases at the moment the latter are generated. The lighter ashes are removed through the flues, and the heavier ones drop through the grate by gravity. The following results are gained by the four apparatus last described: ascension, incandescence, and radiation of and upon the whole surface; continuity of the igneous action, although the charge is intermittent; distillation in the whole section of the furnace; uniform combustion of the same kind throughout the fire bed; introduction of the fuel without interfering with combustion, nor is combustion interfered with after each charge, as the coal rises altogether in one mass, and the projecting pieces need not be struck off for levelling the fire bed.

Having thus described the nature of my Invention, and the manner in which the same is or may be carried into effect, I wish it to be distinctly understood that what I claim as novel, and therefore being secured to me by the herein-before in part recited Letters Patent, is,—

In respect of the first form of my improved apparatus, viz., the charging boxes, the false grate or shovel, the charging boxes, both separately and conjointly, substantially as above described.

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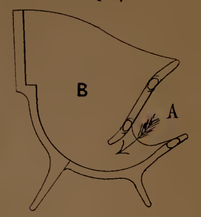

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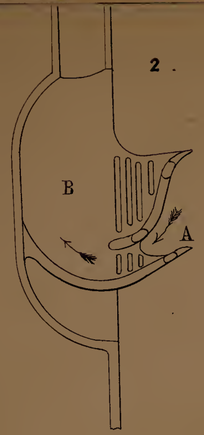

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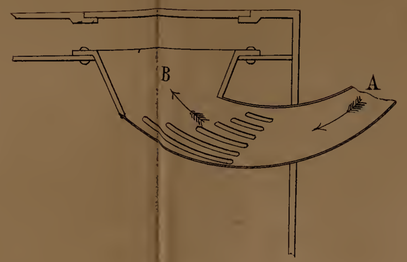

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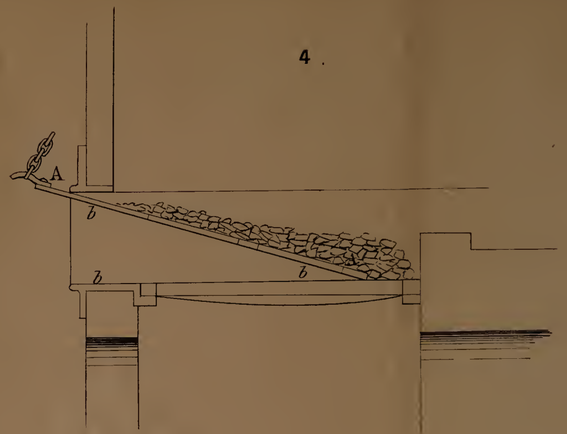

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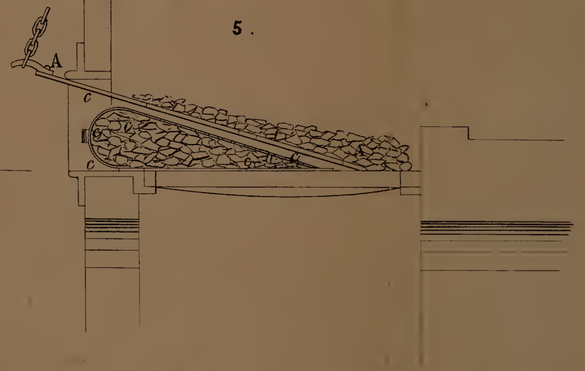
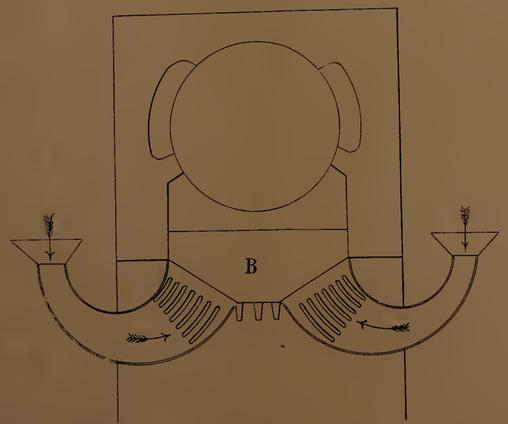


6.



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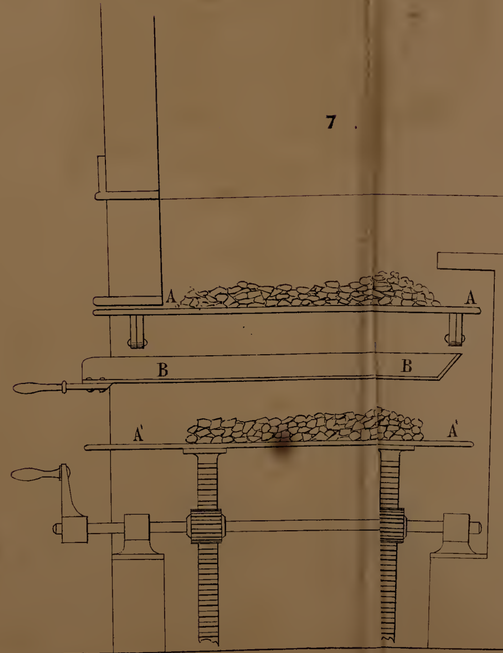

The drawing left with provisional specification is partly colored.

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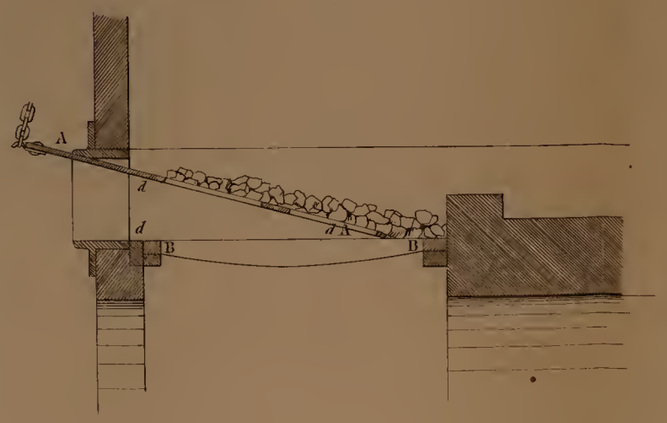
Drawn on Stone by Malby & Sons

A.D. 1855. Jan^{y} 18. N^{o} 129.
DUMÉRY'S SPECIFICATION.

(3 SHEETS)
PL. 1.

1.



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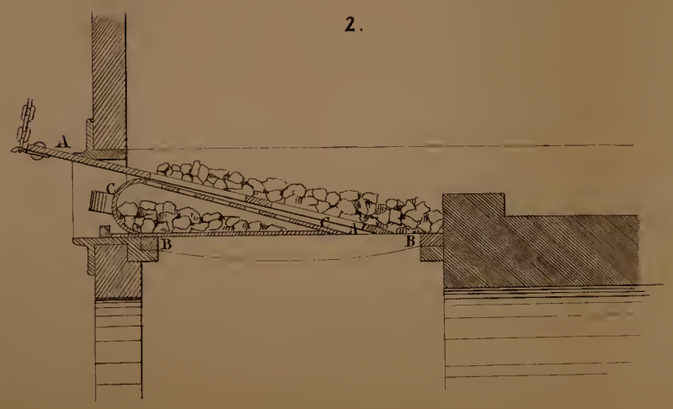
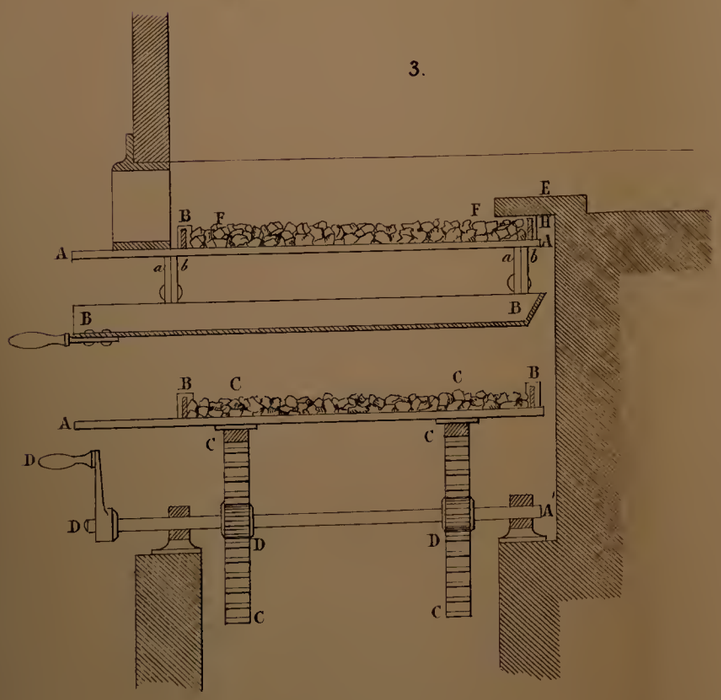


4.

3.



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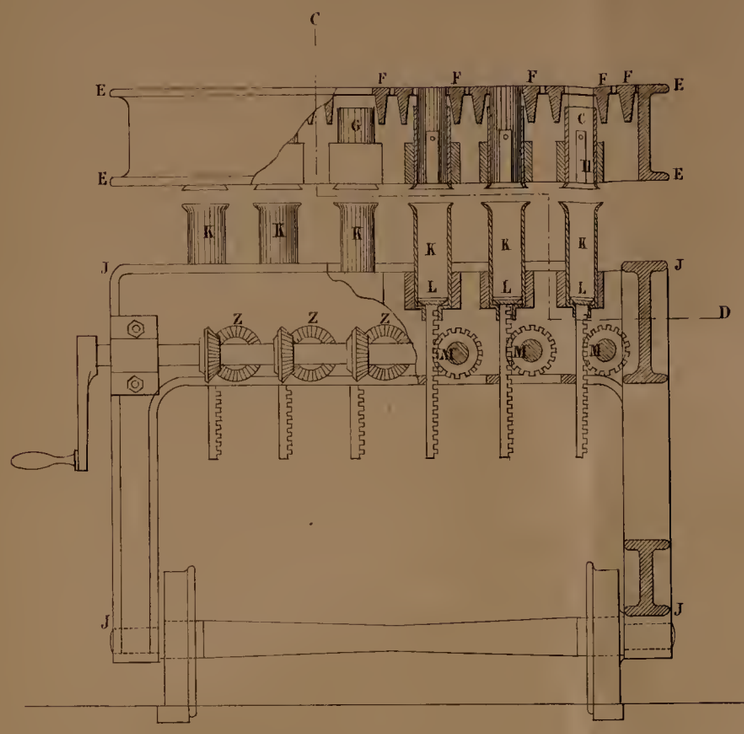

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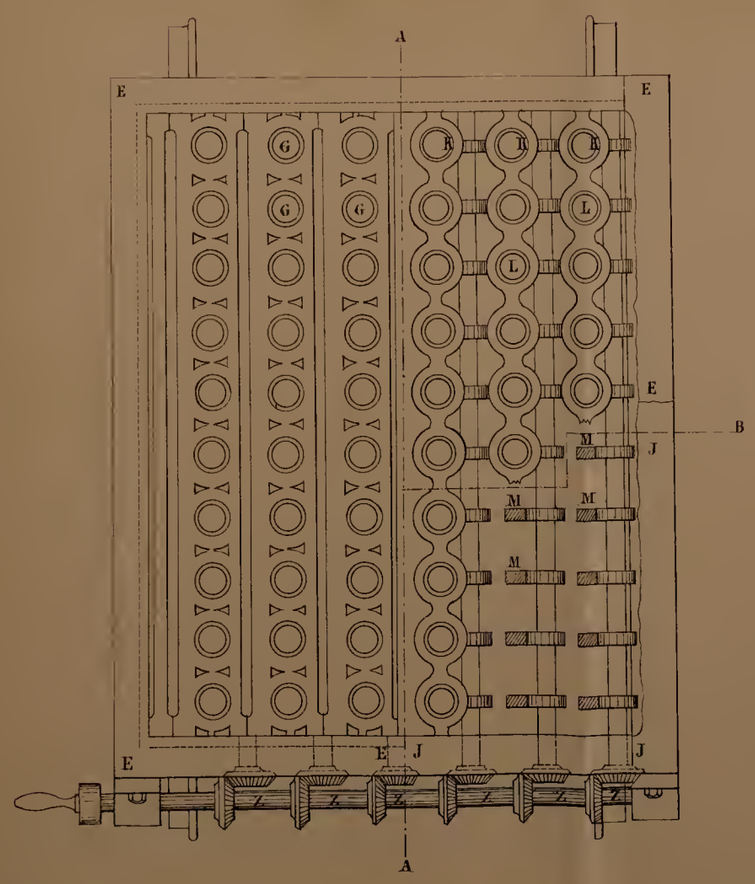

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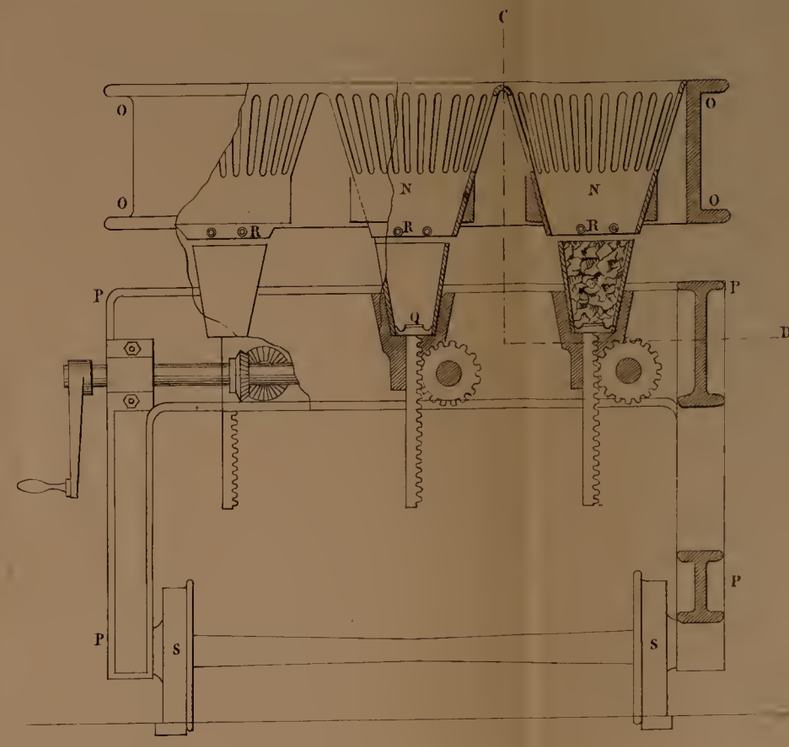

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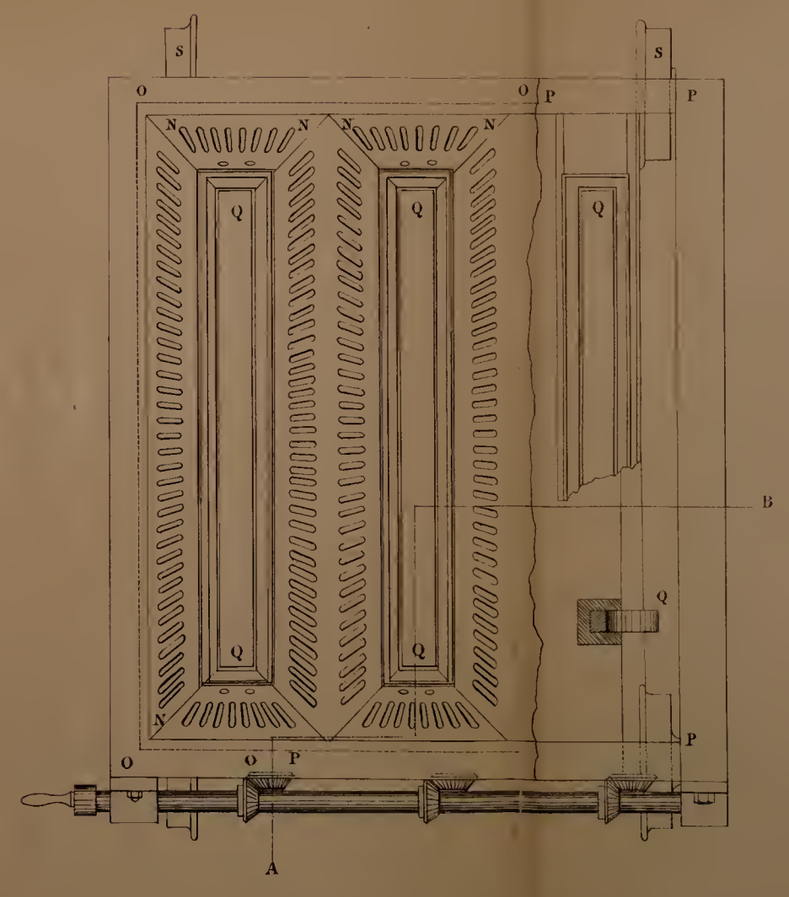

Scale 1 inch = 1 Foot.

The filed drawing is partly colored.

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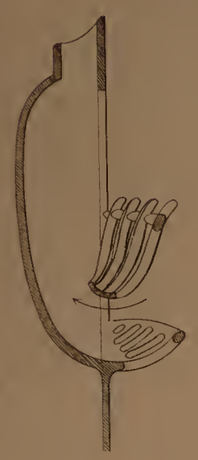
10.



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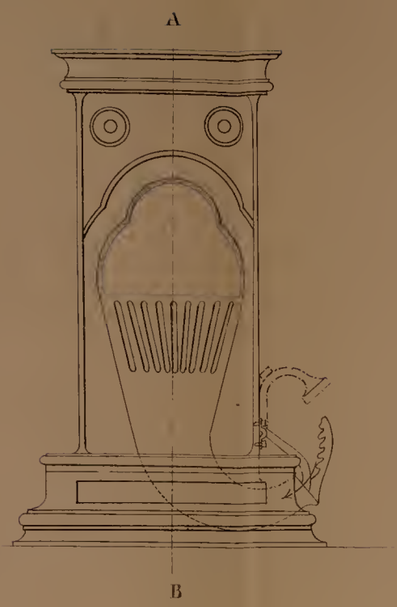

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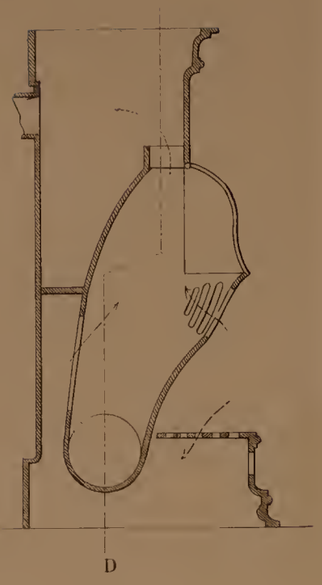

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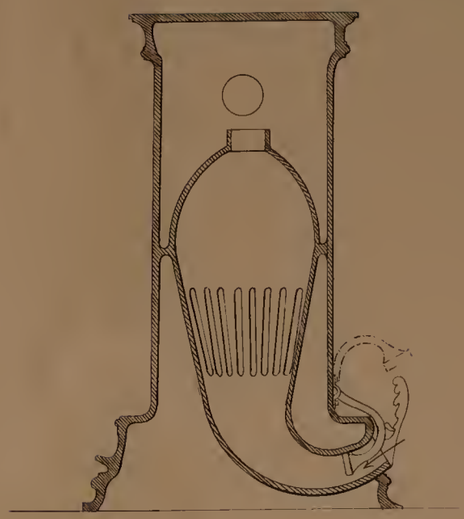

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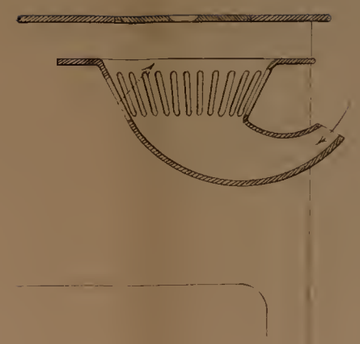

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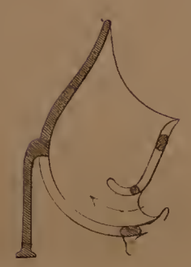

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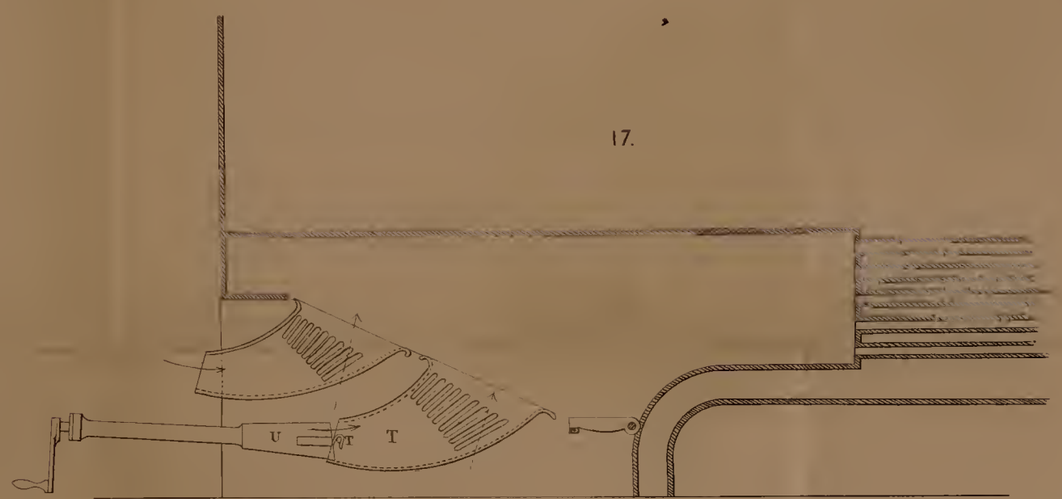

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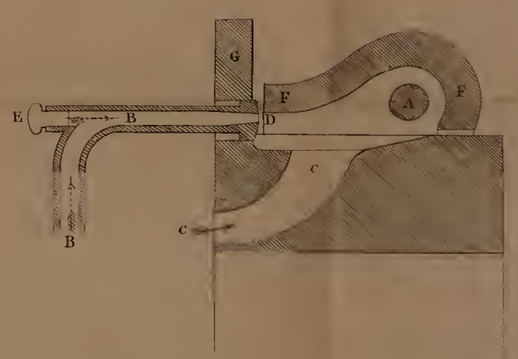

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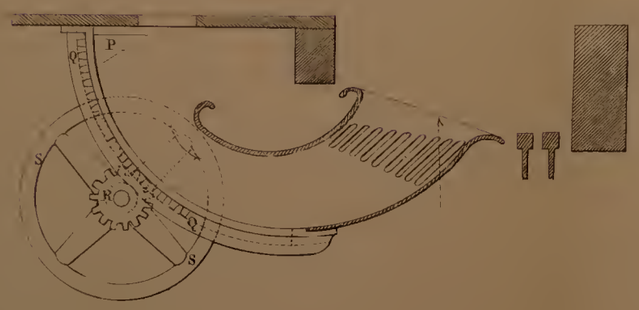

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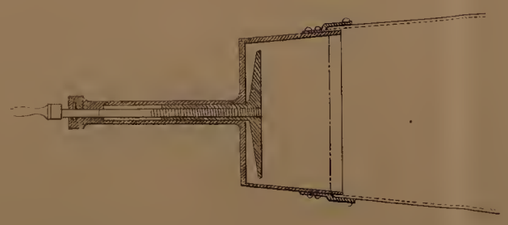

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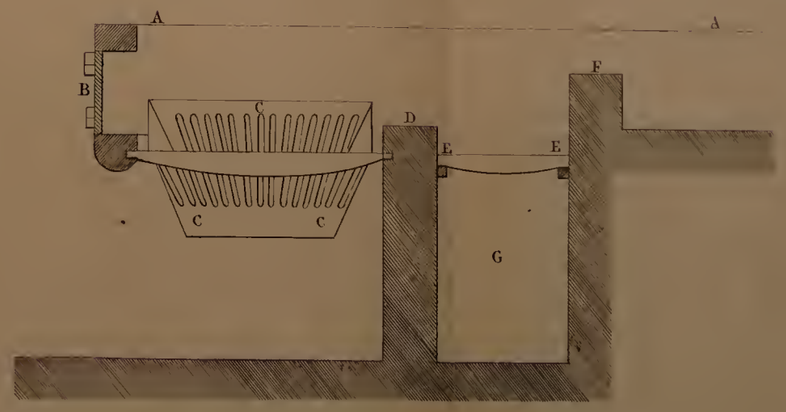

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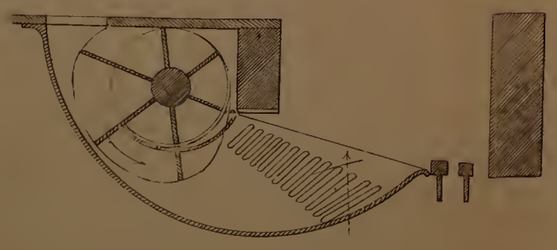

Scales.

Figs. 9. 16. 19. 20 1 inch = 1 Foot.
" 17. 18 ½ inch = 1 Foot.

The tiled drawing is not colored.

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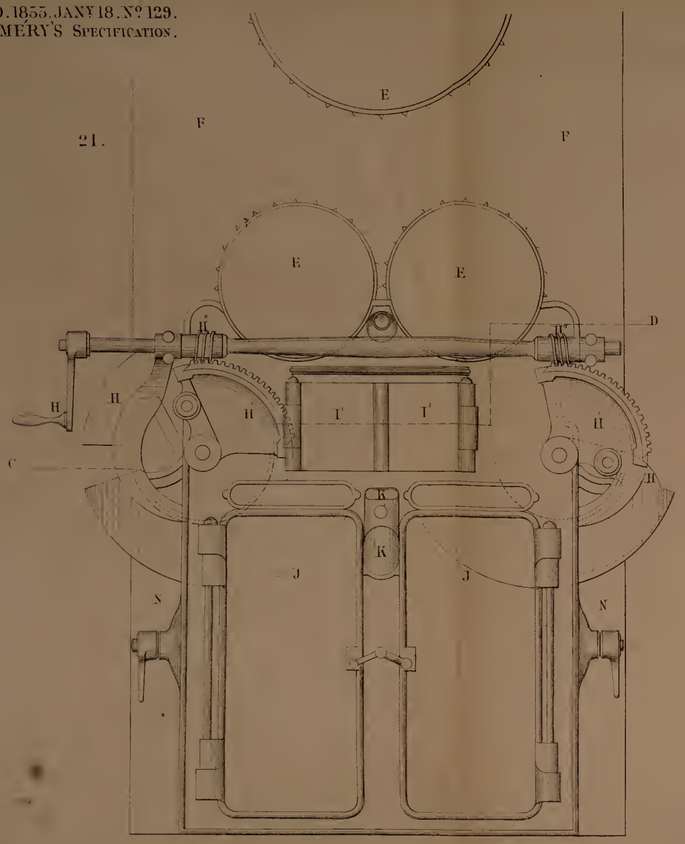
A.D. 1855. JANY 18. Nº 129.
DUMERY'S SPECIFICATION.

(3 SHEETS)
P III.

21.



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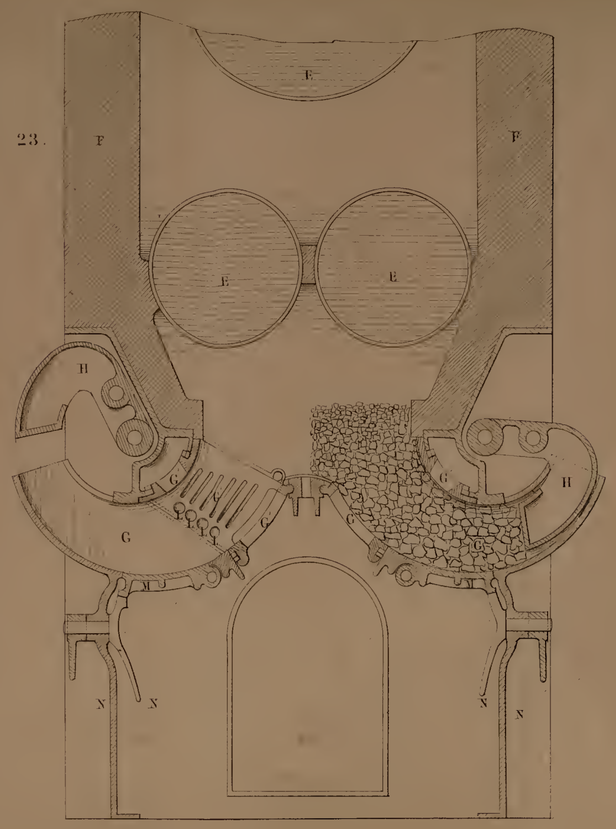

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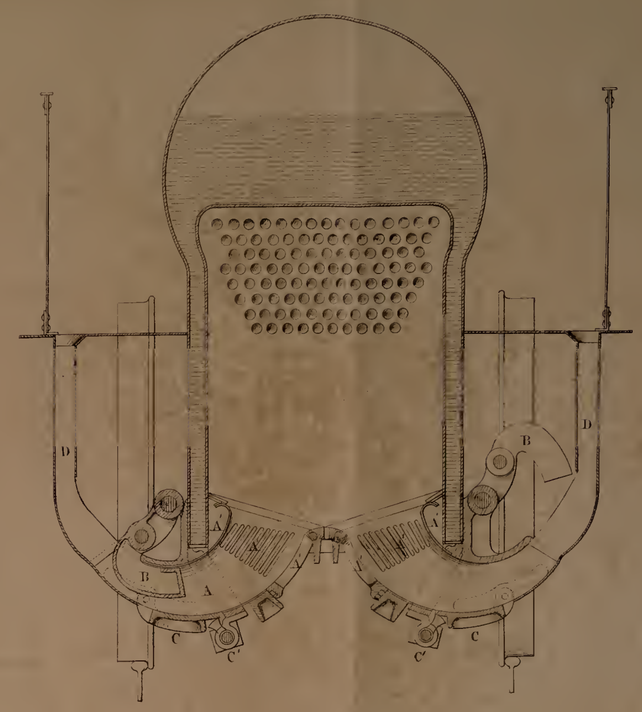
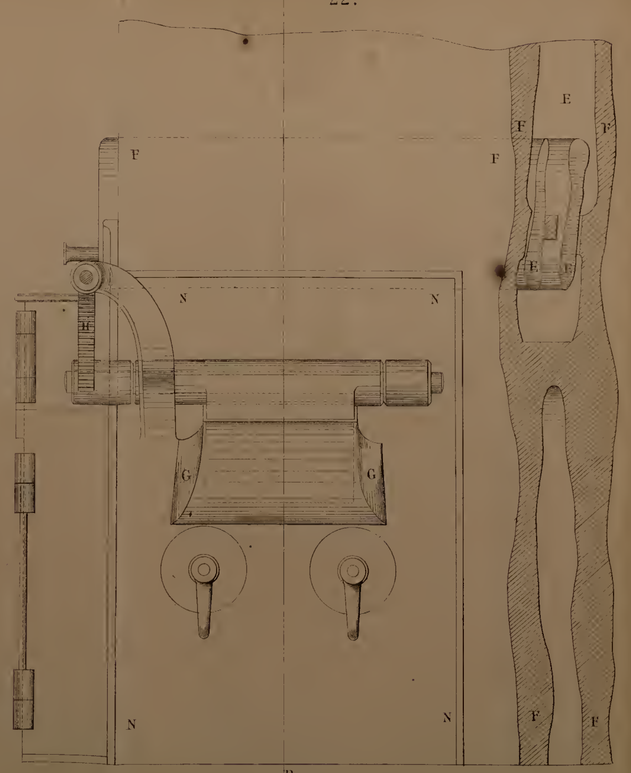


22.



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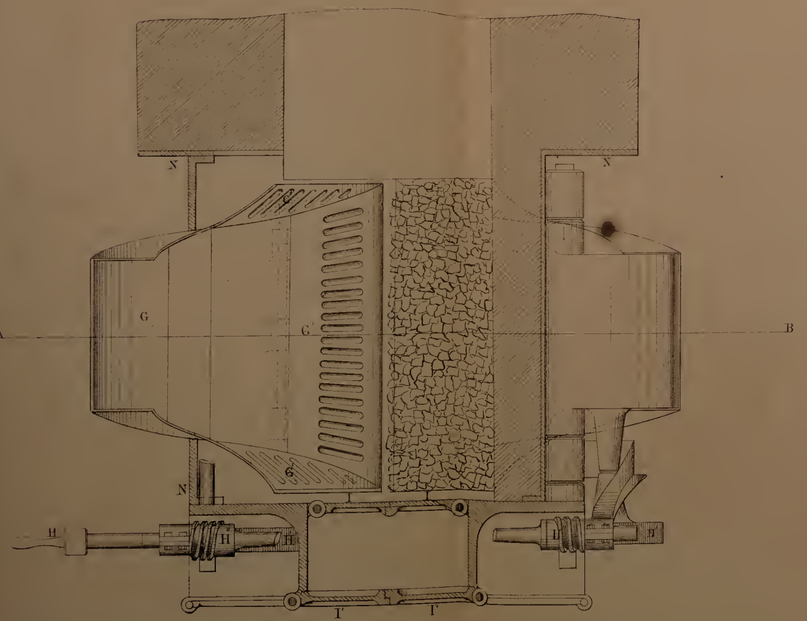

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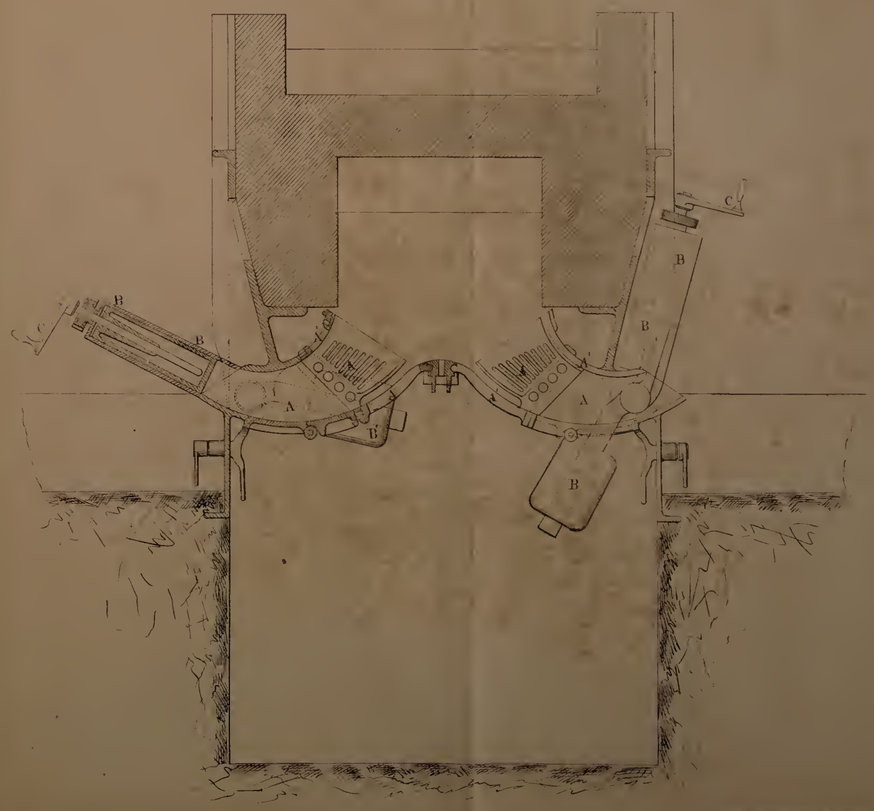

The tinted drawing is partly colored

Scales
Figs 21 24 — 1 inch — 1 Foot.
25 & 26 — ¾ inch — 1 Foot.

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Duméry's Improvements in Smoke-preventing Apparatus.

In respect of the second form of my improved apparatus, the total mobility of the grate; the general passage given to the air; the grate frame, consisting of moveable bars or ledges; and also all these novel features, separately or conjointly, as has been described.

In respect of the third form of my improved apparatus, viz., the fixed grate for moulded fuel; the use of moulded fuel of any kind & shape; and for any purposes, said fuel being made to rise; springs or clicks for retaining the coal and preventing it from descending; definite, regular, and uniform air passages; and a partial or total charging drawer or slide, all these novel features being put into operation separately or conjointly.

In respect of the fourth form of my improved apparatus, the longitudinal or transversal troughs with oblique or slanting sides; grates or grate portions made in said sides for giving passage to the atmospheric air; the bars for supporting the fuel below the line or plane of combustion; the fuel carrying or charging drawers to be used for part or the whole of the grate, all these novel features being applied separately or conjointly.

In respect of the fifth form of my improved apparatus above described, viz., the scoops, scuttles, filling horns, or trumpets; the tapering or conical shape from the furnace towards the entrance; the obliquity or inclined plane; the curvature of the plane upon which the fuel slides into the furnace; the lateral grates for the admission of air; the propellers for the fuel placed and acting beyond the reach of the fire; the clinkers and ashes, all said novel features being applied either separately or conjointly.

In witness whereof, I, the said Constant Jouffroy Duméry, have hereunto set my hand and seal, this Fifteenth day of July, in the year of our Lord One thousand eight hundred and fifty-five.

C. J. DUMÉRY. (L.S.)

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Printers to the Queen's most Excellent Majesty. 1855.